form, and of benzene and carbon bisulphide. In the latter the differences are very slight, and these liquids may be said to preserve their viscosities without appreciable change. But when the constituent liquids have very different viscosities, such as benzene and nitro-benzene, the resultant viscosity is lowered considerably.—Volume measurement of an air thermometer bulb, by W. G. Cady. This may be accomplished without filling the bulb with water or mercury, by connecting it with a short graduated tube, changing the volume of the combination by an amount indicated on the graduations, and measuring the increase of pressure.—Residual viscosity and thermal expansion, by H. D. Day. A bar of vulcanised rubber expanded until 50° was reached, and then suddenly contracted. On again heating after some time, it expanded till it reached the highest temperature at which it had been maintained beforehand, and then contracted again. This phenomenon is due to internal strain in its manufactured state, and to a consequent molecular settling which sets in at certain temperatures.—Application of certain organic acids to the estimation of vanadium, by P. E. Browning and R. J. Goodman. Describes the determination of vanadium by means of tartaric, oxalic, or citric acid in the presence of molybdenum and tungsten.—Determination of oxygen in air and in aqueous solutions, by D. A. Kreider. A known volume of air is conducted through a strong solution of hydriodic acid in the presence of nitric oxide; the acid is neutralised by potassium bicarbonate; and the liberated iodine is titrated with standard decinormal arsenic solution, from which the equivalent volume of oxygen is readily calculated.—Amphibian footprints from the Devonian, by O. C. Marsh. A genuine specimen of a footprint from some vertebrate animal, apparently amphibian, has been found in the Upper Devonian of Pleasant, Warren County, Pennsylvania. This is the first evidence of life superior to the fishes found in that formation. The specimen is preserved in the Yale Museum.

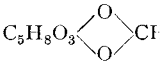
Wiedemann's Annalen der Physik und Chemie, No. 11.—Rotations in a constant electric field, by G. Quincke. Rods, plates, spheres, or cylinders of a dielectric substance, suspended in a liquid dielectric between vertical condenser plates, exhibit slow rotations about an axis parallel or at right angles to the lines of force when a constant field of sufficient intensity is maintained between the plates. The author describes a great variety of experiments which exhibit this curious phenomenon. He explains it by the electrostatic deformation of the air film adhering to the bodies and producing a tangential pressure.—Photo-electric residual action of kathode rays, by J. Elster and H. Geitel. Alkaline chlorides exposed to the action of kathode rays assume peculiar colorations, and become photo-electrically sensitive. At the same time their phosphorescence diminishes, and a bluish film resembling an alkali metal is deposited on the walls of the tube. The authors naturally supposed that this consisted of metallic sodium, potassium, cæsium, or rubidium due to decomposition of their respective salts by the kathode rays. This would account for the observed photo-electric behaviour. But mercury was incapable of forming an amalgam with the deposit, and this explanation is therefore excluded. That it must be sought in a modification of the salt itself is shown by the fact of the photo-electric property remaining in the open air as long as the colour remains. Similar properties are possessed by colourless fluorspar, by potassium carbonate and glass, and to a slighter extent by calcium and barium chlorides. The authors think that a slight reduction takes place, and that the metal produced forms a solid solution in the remainder of the salt.—Interference refractometer for electric waves, by O. Wiedeburg. Describes an arrangement corresponding to Jamin's refractometer adapted to electric waves. The refractive index of paraffin found by this method is 1·418, and of plate glass 2·63, with a probable error of only 1 per cent.—Helmholtz's absolute electro-dynamometer and its use in determining the E.M.F. of a Clark cell, by K. Kahle. The electro-dynamometer consists of a square metallic band acting upon a coil attached to the arm of a balance, the planes of the band and the coil being perpendicular to each other. The square shape has the advantage that only its corners need support, and the band allows of strong currents and simplifies calculation. The E.M.F. of the H-shaped Clark cell was found to be 1·4488 volts at 0° and 1·4322 at 15°.—The cadmium standard cell, by W. Jaeger and R. Wachsmuth. A Clark cell of the H-shape, in which cadmium amalgam is substituted for the zinc amalgam and cadmium sulphate for zinc sulphate has an E.M.F. of 1·019 volts at 20°. It has an extremely small temperature coefficient (0·004 per cent., instead of 0·1 per cent. as in the Clark cell), and it is not surpassed by the ordinary Clark cell as regards durability and facility of reproduction.—Influence of Röntgen rays upon the steam jet, by F. Richarz. Since X-rays make air temporarily conducting, and therefore probably lead to ionic dissociation, they would also on that account increase the condensation in a steam jet. This is actually the case, as the author showed by exposing a steam jet, screened from direct electrostatic action, to the rays traversing an aluminium window.—Aluminium amalgam, by V. Biernacki. This may easily be obtained by dipping an aluminium wire repeatedly into mercury, while each metal is connected with a pole of a battery. It may be kept for a long time in perfectly dry air, but in moist air it oxidises rapidly, forming a growth of pure alumina which makes an attractive lecture experiment.

THE latest issue of the *Izvestia* of the East Siberian branch of the Russian Geographical Society (vol. xxvi., Nos. 4 and 5, Irkutsk, 1896) contains various matters of interest. It begins by an elaborate paper, by A. A. Kaufmann, on the complex forms of land tenure in Siberia. An immense mass of data relative to this question has lately been accumulated by the surveys and explorations which have been made in Siberia, in order to ascertain the area of land which remains free for the new-coming settlers, and the results of these elaborate researches and surveys were embodied in a series of volumes, published by the Ministry of State domains, under the name of "Materials relative to the economical conditions of the peasants in Siberia." M. Kaufmann now sums up the results of these researches, which are the more important as they show what forms of land tenure have been developed by the immigrants themselves, who had been left absolutely free to occupy immense tracts of waste land, and to work out such forms of land tenure as they themselves found convenient. A very great variety of forms of land tenure has thus come into existence in both West and East Siberia, nearly all hitherto known forms of land tenure being represented on this vast area, with the exception of only one, namely the private, hereditary and individual ownership of the land. This last does not exist, while communal possession is everywhere the rule, and it takes a quite unsuspected variety of forms. The prevailing form is the possession by a group of villages, or by the canton or Volost, which includes from ten to fifteen separate villages, and usually has several thousands of inhabitants, who consider the land of the Volost as their common possession, and allot and re-allot it according to their respective needs. Within the estate of the Volost, again, a great variety of forms of land tenure is found, and very often strangers to the canton are also admitted to the temporary possession of parts of the Volost's estate in exchange for similar rights being granted to the inhabitants of the Volost on the land owned by those strangers. On the whole, M. Kaufmann's essay can be earnestly recommended to the attention of the students of the subject in this country.—Two papers, on the Buryates of Irkutsk, by P. E. Kulakoff, and on the Buryates of Transbaikalia, by M. A. Kroll, are full of interest, as the former contains valuable remarks on the influence of the Shamanist religion, the epidemical insanity which lately prevailed in the Buryate settlements, the influence of contact with the Russians, &c.; while the second has new data upon the tribal organisation, and mentions the interesting fact that the Transbaikalia Buryates do not die out as other natives do, but have doubled their numbers since the beginning of this century.—Three papers, on the Yakutes, deal with the old tribal organisation of the Yakutes, with some graves of the beginning of this century, and with the Yakute tales collected by the late M. Khudyakoff, and lately published at Irkutsk under the name of "Verkhoyanskiy Sbornik."—V. B. Shostakovich contributes a paper on the protective adaptations of the buds in different Siberian trees and bushes (with one plate); and Prof. Katanoff gives an account of the Turkish inscriptions on the Orkhon and the Yenisei.

SOCIETIES AND ACADEMIES.

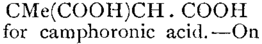
LONDON.

Chemical Society, November 5.—Mr. A. G. Vernon Harcourt, President, in the chair.—The following papers were read:—The constitution of the so-called nitrogen iodide, by F. D. Chattaway. The most probable formula assignable to nitrogen iodide is NH_3I_2; it is decomposed by excess of water, giving iodine and ammonium iodide and hypoiodite. The author has examined its reactions.—The carbohydrates of barley straw, by C. F. Cross, E. J. Bevan, and C. Smith. Evidence is adduced which points to the gradual transformation in barley straw, of a hexose into a pentose derivative; a transition form of the constitution



$C_5H_8O_3\langle{}^{O}_{O}\rangle CH_2$

appears to exist.—The direct union of carbon and hydrogen, by W. A. Bone and D. S. Jerdan. Much acetylene and some methane are found in dry hydrogen gas in which an electric arc has burnt between carbon poles.—The explosion of acetylene with less than its own volume of oxygen, by W. A. Bone and J. C. Cain.—The refraction constants of crystalline salts, by W. J. Pope. The molecular refractions of crystalline salts, calculated from the several principal refractive indices, is an additive property.—Compounds of metallic hydroxides with iodine, by T. Rettie.—Economical preparation of hydroxylamine sulphate, by E. Divers and T. Haga. Sodium nitrite, sulphonated with sodium sulphite and hydrolysed, yields nearly its own weight of hydroxylamine sulphate.—The reduction of nitrososulphates, by E. Divers and T. Haga. Potassium nitrososulphate, when reduced with sodium amalgam, yields hyponitrite, sulphite, sulphate, amidosulphonate, nitrous oxide, hydrazine, ammonia and nitrogen.—Imidosulphonates, Part ii., by E. Divers and T. Haga.—Amidosulphonic acid, by E. Divers and T. Haga. An economical method of preparing this acid is given, and its properties and reactions are described.—Molecular conductivity of amidosulphonic acid, by J. Sakurai.—The physiological action of amidosulphonic acid, by O. Loew. The salts of this acid seem poisonous only to phænogamous plants, and not to other forms of vegetable or to animal life.—How mercurous and mercuric salts change into each other, by S. Hada.—The effect of heat on aqueous solutions of chrome alum, by Miss M. D. Dougal. Experiments on the diffusion of violet and green chrome alum solutions harmonise with the view that the green solutions contain sulphuric acid and a colloïdal chromylsulphuric acid.—On the hydrolysis of ethylic dicarboxylglutaconate, by H. W. Bolam.—The periodic law, by R. M. Deeley.—The colouring matters occurring in various British plants, by A. G. Perkin and J. J. Hummel. The colouring matter of the yellow wallflower (*Cheiranthus cheiri*) consists of quercitin and a new substance, isorhamnetin, $C_{16}H_{12}O_7$; the colouring matter of white hawthorn blossoms (*Cratægus oxycantha*) is quercitin.—Position-isomerism and optical activity; the comparative rotatory powers of the dibenzoyl- and ditoluyl-tartrates, by P. Frankland and F. M. Wharton.—Researches on the terpenes. VII. Halogen derivates of camphor, by J. E. Marsh and J. H. Gardner. Bromine and phosphorous trichloride convert camphor into two isomeric tribromocamphene hydrobromides, $C_{10}H_{14}Br_4$; they are both convertible into the same tribromocamphene, $C_{10}H_{13}Br_3$. A number of bromo- and chloro-camphene derivatives have been obtained.—Derivatives of camphenesulphonic acids, by A. Lapworth and F. S. Kipping.—Preparation of dimethylketohexamethylene and experiments on the synthesis of dimethylhexamethenylmalonic acid, by F. S. Kipping and W. B. Edwards.—Sulphocamphylic acid, $C_9H_{14}SO_5$, with remarks on the constitution of camphoric acid and of camphoronic acid, by W. H. Perkin, jun. The further study of the decomposition products of α- and β-camphylic acids leads to results which can be explained on the assumption that camphoric acid has the constitution



$$\begin{array}{l} CMe_2 . CH_2 . CH_2 \\ | \qquad\qquad\quad | \\ CMe(COOH)CH . COOH \end{array}$$

; this view supports Bredt's formula for camphoronic acid.—On Pettenkofer's method for determining carbonic anhydride in air, by Prof. Letts and R. F. Blake. By employing precautions suggested by the authors, Pettenkofer's method can be made of great accuracy and delicacy.

Geological Society, November 4.—Dr. Henry Hicks, F.R.S., President, in the chair.—The President referred to the loss which the Society had sustained by the decease of Prof. A. H. Green, F.R.S., who had served for some years on the Council, and was Vice-President at the time of his death.—The President announced that Lady Prestwich, in fulfilment of the terms of a bequest of her late husband, had offered to the Society 260 bound volumes of geological tracts from his library. Also that a sum of £800 had been bequeathed to the Society by Sir Joseph Prestwich, the interest to be applied to the triennial award of a medal and fund: this bequest to take effect subsequent to the decease of Lady Prestwich.—Additional note on the sections near the summit of the Furka Pass (Switzerland), by Prof. T. G. Bonney, F.R.S. The author, during a visit to Switzerland in 1895, had taken the opportunity of completing the examination of the sections on the western side of the Furka Pass, and of glancing again at those previously studied. His observations support the view that the white, sometimes slightly quartzose or micaceous, marble which crosses the summit of the Pass is a rock much older than the Mesozoic era. Dr. J. W. Gregory thought that Prof. Bonney's maintenance of his former conclusion after a third study of the relations of the saccharoidal and the Jurassic limestones would lessen the value attached to the difficulties of his theory. Neither explanation is free from difficulty, but the constant differences now found between the two rocks greatly increase the probabilities in favour of the fault-theory. In reply the author said they must either assume very peculiar faulting or very sporadic and inexplicable metamorphism—seeing that the marble was totally different from the adjacent Jurassic rocks, was exactly like the marbles elsewhere members of the crystalline schists, and evidently had been affected by pressure after it had become a marble, while the other was simply a limestone affected by pressure. Hence he thought that the hypothesis of faults offered the fewer difficulties.—Geological and petrographical studies of the Sudbury Nickel District (Canada), by Dr. T. L. Walker. Sudbury is a small town situated in Northern Ontario, in the centre of the nickel-mining district. North of the Great Lakes granite and gneiss form almost boundless terranes, interrupted only by belts of Huronian rocks, which are in turn associated with post-Huronian eruptives, the most important of which are the large nickel-bearing massives. The nickel-bearing rocks, which are eruptive, form long elliptical stocks which conform to the strike of the Huronian rocks containing them. Contact-action indicates that they are younger than the rocks previously referred to. The smaller eruptives are composed of greenstone, which appears to have been formed from norite or gabbro. Some of the larger eruptives, however, have been highly differentiated on cooling, as they are now composed of granite and greenstone with gradual transitions from the one to the other. The greenstone generally forms one side of the eruptive, and on the outer border is often characterised by large masses of nickeliferous pyrrhotite, chalcopyrite, and nickeliferous pyrite, with frequent smaller masses of magnetic iron-ore rich in titanic acid. The author regarded these mineral masses as genetically related to the greenstone and granite, in that they appear to be the extreme products of differentiation. About half the world's nickel supply is drawn from these deposits.—On the distribution in space of the accessory shocks of the great Japanese earthquake of 1891, by Dr. Charles Davison. The object of the author in this paper is to consider the geographical distribution of the numerous shocks which preceded and followed the great earthquake of 1891. Reasons were given for believing that the distribution of earthquakes in 1890–91 was little, if at all, due to the marked shock of May 12, 1889, but that the earthquakes of these years were preparatory to the great earthquake, the consequent relief at numerous and widely distributed points equalising the effective strain along the whole fault-system, and so clearing the way for one or more almost instantaneous slips along its entire length. This outlining of the fault-system points to the previous existence of the faults, and implies that the great earthquake was due not to the rupturing of the strata, but probably to the intense friction called into action by the sudden displacement. The distribution of the after-shocks was then discussed, and it was maintained that the after-shocks of the Mino-Owari earthquake for the first fourteen months were subject to the following conditions: decline of frequency, decrease in the area of seismic action, and a gradual but oscillating withdrawal of that action to a more or less central district. Prof. Milne said that the Mino-Owari earthquake had furnished a greater number and a more varied series of seismic phenomena for analysis than had been noted in connection with any disturbance previously recorded. When this earthquake took place an enormous fault, which can be traced over a length of more than forty miles, appeared upon the surface, and it was usually supposed that the sudden rupture and displacement of vast masses of material along this line were the cause of the earthquake. On account of a peculiar distribution of shocks which took place prior to 1891, Dr.

Davison argued that the fault or faults in the Mino-Owari district were outlined before the occurrence of the great earthquake, which was, therefore, only the result of their extension. This may have been so, but it must be remembered that before 1891 the number of shocks occurring in the Mino-Owari plain were not numerous; and as from 1889 to 1891 it cannot be said that they increased in number, while their distribution, as exhibited by maps, was largely dependent upon the observing-stations. Where the maps showed blank spaces, in many cases the country was mountainous, and there were no observers.

Linnean Society, November 5.—Dr. Günther, F.R.S., President, in the chair.—Dr. Morris, C.M.G., Royal Gardens, Kew, exhibited specimens and slides illustrating the occurrence of raphides in the bulbs of the common hyacinth of gardens (*Hyacinthus orientalis* and varieties). Forms of eczema were said to have been produced in persons handling and cleaning these bulbs. Although the fact was familiar to gardeners, the cause did not appear to have been clearly traced. Experiments and observations at the Jodrell Laboratory at Kew had shown that both dry and moist scales were capable of producing considerable irritation in certain cases when applied directly to the skin. There was little doubt that the raphides were the prime agents. These needle-shaped crystals (composed of oxalate of lime) varied from $\frac{1}{100}$th to $\frac{1}{200}$th of an inch in length, and were arranged in close bundles, easily dispersed by rubbing the dry scales. In the growing plants they were doubtless protective, as snails, for instance, avoided hyacinth bulbs, but attacked others growing close by. Roman hyacinths (var. *albulus*) were understood to cause greater irritation than other varieties. Dr. D. H. Scott described some experiments which he had tried, tending to confirm the conclusion that the irritation of the skin produced by contact with the bulb-scales of Hyacinths is due immediately to puncture by the numerous raphides.—On behalf of Dr. H. B. Hewetson, of Leeds, Mr. Harting exhibited photographs of a specimen of Macqueen's Bustard (*Otis Macqueeni*) which had been shot at Easington, in Holderness, on October 17 last, and gave a brief account of the species, which had now been met with in England for the third time; the first instance of its occurrence having been noticed in Lincolnshire in October 1847, and the second in Yorkshire in October 1892.—Mr. Hugh Warrand exhibited a remarkable bird which was believed at first to be a hybrid between the Red Grouse and Ptarmigan, but which in the opinion of Mr. Ogilvie Grant, Mr. Millais, and Mr. Harting, could only be regarded as an abnormally pale-coloured grouse. Only one possible instance had been recorded of such a hybrid as was suggested, viz. in the case of a bird which was exhibited some years ago by Prof. Newton to the Zoological Society (*P. Z. S.*, 1878, p. 793) and had since been figured by Mr. Millais in his work on Game Birds. A specimen of the Cream-coloured Courser (*Cursorius isabellinus*), an extremely rare visitor to this country from North Africa (probably *viâ* Spain), which had been shot on Salisbury Plain, at Earlstoke, on October 10 last, was exhibited by Mr. Harting, who gave particulars of the occurrence, and stated that another example of this bird had since been obtained in Bouley Bay, Jersey.—A paper by Mr. A. W. Waters, on Mediterranean Bryozoa was then read. Dealing in the first place with some *Cellulariidæ* and other Bryozoa from Rapallo, the paper was to some extent a revision of work already published on Mediterranean Bryozoa. Stress was laid upon the importance of noting the position from which the radicle-tube grows, and this was found to be a character of specific value.—Dr. S. Schönland communicated a paper on some new species of *Crassula* from South Africa, which he had obtained from localities which had been very rarely visited by botanical collectors, and which were believed to be undescribed. Mr. J. G. Baker, who criticised the paper, spoke in favourable terms of the care which had been taken by the author in its preparation, and thought there was sufficient justification for describing the species mentioned as new.—A revisionary monograph of the New Zealand Holothurians, by Prof. A. Dendy, of Christchurch, N.Z., was read.—The Rev. J. Whitmee made some remarks on the Trepang fishery in Samoa, where several edible species of Holothurians are gathered and prepared for the market, and called attention to the well-known fact that a small fish of the genus *Fierasfer* used the body of the Holothurian as a habitation.

Mathematical Society, November 12.—Major MacMahon, R.A., F.R.S., President, in the chair.—The President briefly stated the grounds of the award by the Council of the De Morgan medal to Mr. S. Roberts, F.R.S.; and after receiving the medal, Mr. Roberts thanked the Council and the members for the honour they had conferred upon him, and said that his connection with the Society had been of great service to him.—The ballot was then taken, with the result that the gentlemen whose names are given in NATURE for October 22, were declared to be duly elected to form the Council for the ensuing session—Prof. Elliott, F.R.S., having taken the chair, called upon Major MacMahon to read his address, which was on "The Combinatory Analysis." Mr. S. Roberts gave, in abstract, an account of Herr E. Lasker's "Essay on the Geometrical Calculus, Part 1." The titles only of the following papers were read, owing to the lateness of the hour:—"Symbolic Logic," H. MacColl; "On a General Integral with some physical applications," G. J. Hurst; "On Ratio," Prof. M. J. M. Hill, F.R.S.; "On the Geometrical Construction of Models of Cubic Surfaces," W. H. Blythe; "Theory of Vortex Rings," H. S. Carslaw; "Differentiation of Spherical Harmonics," E. G. Gallop; "On the Application of Jacobi's Dynamical Method to the General Problem of Three Bodies," and "On certain properties of the mean motions and the secular accelerations of the principal arguments used in the Lunar Theory," Prof. E. W. Brown; "Note on the Symmetric Group," Prof. W. Burnside, F.R.S.; "Note on the Capacity of a Conductor in the form of two intersecting spheres," W. D. Niven, F.R.S.

CAMBRIDGE.

Philosophical Society, October 26.—Prof. Hughes, Vice-President, in the chair.—The following elections were made:—President: Mr. F. Darwin. Vice-Presidents: Prof. G. D. Liveing, Prof. Newton, Prof. J. J. Thomson. Treasurer: Mr. Glazebrook. Secretaries: Mr. Newall, Mr. Bateson, Mr. Baker. Ordinary Members of Council: Dr. Gaskell, Mr. Marr, Mr. Larmor, Dr. Marshall Ward, Mr. Shipley.—Mr. F. Darwin, President, then took the chair.—Mr. S. F. Harmer exhibited the casts of *Iguanodon bernissartensis*, Boulenger, recently presented to the Museum of Zoology by H.M. the King of the Belgians. The casts are reproductions of some of the famous specimens preserved in the "Musée Royal d'Histoire Naturelle de Belgique," at Brussels. These specimens were discovered in April 1878, in the colliery of Bernissart, a village situated between Mons and Tournai, close to the French frontier. The bones, which are of Wealden age, were found at a depth of 356 metres (322 metres below sea-level). Nearly thirty complete skeletons, belonging to full-grown individuals, were found at the time of the original discovery, or at a later period; the great majority belonging to *I. bernissartensis*, and the others to *I. mantelli*, well known in England through the labours of Mantell, Owen and others. Although much had been done in England and elsewhere, towards understanding the structure of *Iguanodon*, no skeleton which was more than fragmentary had been described before the Belgian discoveries were made. Prof. Newton stated that the importance attached by many high authorities to the group of Dinosaurs known as *Ornithopoda*, from their resemblance in several points to the class *Aves*, had long made him desirous of obtaining for the Museum of Zoology a cast of one of the famous Belgian *Iguanodon* skeletons. About a year ago he mentioned the subject to the High Steward of the University, who, with his accustomed kindness and energy, at once asked Her Majesty's Minister at Brussels to find out on what terms the want could be supplied. In due time an answer was received by Lord Walsingham that this could be done by the University paying for the cast or offering in exchange specimens to the value of 200*l*. Meanwhile the subject had been also mentioned to the late Lord Lilford, who had for many years been so great a benefactor to the museum, and he at once addressed the late Rev. Horace Waller, well known as a companion of Livingstone. Mr. Waller suggested an application to King Leopold himself, through his personal friend Sir John Kirk. To this Sir John readily consented, and, on His Majesty visiting London last winter, made known to him how acceptable the gift of a cast would be. The King was graciously pleased to entertain the application favourably, and gave orders accordingly, with the result that after a short correspondence with M. Dupont, the Director of the Museum at Brussels, not a single cast only, but the magnificent series now exhibited arrived in the course of the summer, and owing to the royal donation having liberally included the necessary ironwork, the skeleton was mounted without difficulty. Though the thanks of the Senate have been most properly offered to H.M. the King of the Belgians for his great munificence, and this token of his good will, the gratitude of all here is equally due to Sir John Kirk, without whose kind and ready intervention, the University would have been unable to procure this desirable acquisition.—Remarks on the structure and affinities of *Iguanodon*, by Mr. H. Gadow. Though birds are descendants of some reptilian stock, it was held that the particular group of ancestral reptiles is not to be found among the Iguanodonta, not even among the much wider group of Dinosauri, in spite of the close resemblance of the pelvis and most parts of the hind-limbs with the corresponding organs in birds. The composition of the skull, the formation of the fore-limbs, and the palæontological evidence absolutely forbid such an intimate connection with birds. Bipedalism, upright gait, is a feature which has been acquired independently and at various geological epochs by the most heterogeneous creatures, for instance by kangaroos, jerboas, birds, iguanodonts, and even by chlamydosaurus, the peculiar frilled lizard of Queensland.—Notes on cyclostomatous polyzoa, by Mr. S. F. Harmer.

DUBLIN.

Royal Irish Academy, November 9.—The Earl of Rosse, President, in the chair.—Dr. R. F. Scharff read a paper on the origin of the European fauna. In a previous paper he had dwelt on the importance of, in the first place, ascertaining the facts relating to the origin of the fauna of a small area, such as that of Great Britain or Ireland. If that of Great Britain be closely examined, its fauna will be found to consist of three elements, viz. northern, southern, and eastern. There is also a mass of evidence to prove that this latter element reached England after the others, and this is strengthened by the fact that the eastern fauna, which in many respects corresponds with the so-called Teutonic flora, is absent from Ireland. If the geological date of the arrival of this eastern, or, as it might be called, Siberian fauna into England, could be even approximately ascertained, the period of the migration of the southern and northern faunas could also be fixed as taking place at an earlier period, while the separation of Ireland would have occurred at a time intermediate between these events. Dr. Scharff showed that not only was the lower continental boulder clay an undoubtedly marine deposit, but that the eastern or Siberian migration-forms all occur in inter-glacial or later deposits, overlying the boulder clay. The very earliest members of that migration arrived in England during the deposition of the forest bed, so that the newest English, so-called, pliocene crags would therefore be contemporaneous with the lower continental boulder clay. The faunistic evidence proved that the land connection between Ireland, Scotland and Scandinavia, existed until a much later period, and that the Arctic marine fauna which is found in the newer English crags came direct from the Arctic Ocean across the plains of Northern Europe. At that period it was suggested that the Arctic Ocean was completely separated from the Atlantic Ocean. To enable the mammoth to cross from Asia, with other large mammals, the American and Asiatic continents must have been connected at Behring's Straits, whilst another mass of land stretched from Arctic America by way of Greenland and Spitzbergen to northern Scandinavia. The Arctic Ocean swept over Russia and Northern Germany, as far as the east coast of Great Britain. The climatic conditions of European land as then existing were peculiar; while the west coasts of the British Islands and Scandinavia were bathed by the waters of the Gulf Stream, the eastern shores of these countries were lashed by the waters of the Arctic Ocean. There therefore existed the necessary conditions for an excessive snowfall and consequent glaciation on the territories between the two oceans, without requiring any very extreme lowering of the temperature in Northern Europe—viz. evaporation of the warm waters from the Gulf Stream, and the condensation of these vapours on their coming into contact with the cold air from the Arctic Sea.—A paper on the melting point of some minerals, being work done in the Physical Laboratory of Trinity College, Dublin, by Mr. Ralph Cusack, was communicated by Prof. G. F. FitzGerald, F.R.S.—Sir Robert Ball, F.R.S., communicated a memoir, being the eleventh, on the theory of screws, entitled "Further development of the relations between impulsive screws and instantaneous screws."—Several recently-published parts of the thirtieth volume of *Transactions* were laid on the table.

PARIS.

Academy of Sciences, November 16.—M. A. Cornu in the chair.—The Perpetual Secretary announced to the Academy the loss it had sustained by the death of M. H. Gyldén, of Stockholm, Correspondent in the Astronomical Section.—Notice on the work of M. Hugo Gyldén, by M. O. Callandreau.—Researches on phosphoric acid; estimation of pyrophosphoric acid, by MM. Berthelot and G. André. The pyrophosphoric acid is precipitated as magnesium pyrophosphate in presence of an excess of acetic acid, by a mixture of magnesium chloride, ammonium chloride, and ammonium acetate. Test analyses are given showing the accuracy obtainable by this method.—Transformations of pyrophosphoric acid, by MM. Berthelot and André. The acid was prepared by the action of an aqueous solution of hydrogen sulphide upon the lead salt. The aqueous acid is very slowly converted into orthophosphoric acid, 87 per cent. remaining unchanged after five days' standing, 43 per cent. after 121 days, no metaphosphoric acid being formed. The velocity of transformation is greater the more concentrated the solution.—On the earths of the yttrium group contained in the monazite sands, by MM. P. Schutzenberger and Boudouard. Two methods have been tried for the separation of these earths, the fractional crystallisation of the sulphates from the hot aqueous solutions, and the partial decomposition of the nitrates. All attempts at separation by the first method proved ineffectual, but the fractional decomposition of the nitrates by heat gave better results, fractions being obtained with atomic weights varying between 92 and 148. Only one spectrum, however, that of yttria, was given by all the fractions.—Determination of the positions of Santa Cruz, Teneriffe, Saint Louis (Senegal), and Dakar; measurement of the acceleration due to gravity, by M. Bouquet de la Grye.—Memoirs on some problems in navigation and on magnetic observations at sea, by M. Guyou.—On an extension which may be given to a theorem by Poisson, relating to the invariability of the axes, by M. H. Andoyer.—On the convergence of uniform substitutions, by M. E. M. Léméray.—On surfaces of lines of isometric curvature, by M. T. Craig.—Some problems in rigid mechanics, by M. René de Saussure.—On the permanent changes of glass, and the displacement of the zero points of thermometers, by M. L. Marchis. With a view of studying the laws regulating the changes of zero in mercury-glass thermometers, a glass was purposely chosen that should make these changes as large as possible. The experiments were conducted at temperatures between $-60°$ C. and $357°$ C.—Influence of magnetisation upon the electromotive force of a thermo-couple, of which iron is one of the elements, by MM. U. Lala and A. Fournier. A diminution of the electromotive force was observed to take place when the couple was placed in a strong magnetic field.—The absolute measurement of small thicknesses, by MM. Ch. Fabry and A. Perot.—On the densities of nitrogen, oxygen, and argon, and the composition of atmospheric air, by M. A. Leduc (see p. 84).—On a law relating to water vapour, by M. Rateau.—On a new tap for use with compressed gas-cylinders. This tap is so constructed as to allow rapid filling during compression, but to prevent the rapid exit of the gas. It is especially suitable for use with liquefied acetylene.—The neutrality of salts with reference to coloured indicators, by M. H. Lescœur. The blueing of litmus, or reddening of phenol-phthaleïn, is regarded as indicating not the change from acidity to alkalinity, but from neutrality to alkalinity. With methyl orange, on the contrary, the change to yellow indicates the change from acidity to neutrality. A salt would, from this point of view, be defined as neutral if methyl orange and phenol-phthaleïn remained colourless, and litmus remained red. Under this definition, such salts as alum and zinc sulphate would be neutral.—Action of sulphuric acid and iodine upon iodic acid. Practically pure iodic anhydride in crystals can be obtained by recrystallising the crude substance from concentrated sulphuric acid to which a little fuming nitric acid has been added.—Analysis of air by *Agaricus atramentarius*, by M. T. L. Phipson. The absorption of oxygen from a confined volume of air by this fungus appears to be as complete as with phosphorus.—On some properties of pure glucina, by M. P. Lebeau. Glucina melted in the electric furnace has its density practically unchanged. The oxide is not reduced by heating with magnesium, sodium, potassium, or aluminium, but boron, silicon, and carbon can reduce it with the formation of crystalline compounds.—On an iodide of molybdenum, by M. Guichard. By the action of hydrogen iodide upon the chloride $MoCl_5$, the iodide MoI_2 can be prepared in the amorphous state.—On the separation of tungsten and titanium, by M. Ed. Defacqz.—The spectrum of chlorophyll, by M. A. Étard. The conclusion is drawn that several distinct green colouring matters have been described under the name of chlorophyll.—On the fixation of atmospheric nitrogen by the association of algæ and bacteria, by M. Raoul Bouilhac.—The organic material of the mineral water from Tulle-Haut, by M. F. Garrigou. The residue from thirty litres of this mineral water gave reactions indicating the presence of an alkaloidal substance.—On the distribution of lipase in the organism, by M. Hanriot. Various parts of the body were examined, but lipase was only found in notable quantity in the serum, pancreas, and liver.—The achromatometer, by M. A. M. Bloch. An instrument to measure the pressure necessary to decolourise and render bloodless a limited portion of tissue. It differs from previous instruments of the same class in that its use is not limited to the horizontal position.—On the parasitism of the *Monstrillidæ*, by M. A. Giard. The *Monstrillidæ* offer the first example of a parasitic crustacean.—Researches on the morphology of *Trichomonas intestinalis*, by M. J. Kunstler.—Ravages caused in Algeria by the caterpillars of *Sesamia nonagrioides* (Lefevre) to maize, sugar-cane, and other plants, by M. J. Kunckel d'Herculais. Observations on the habits, and on the best means of combating this pest.—On the pool of Berre, and pools situated in its neighbourhood, on the coast of Provence, by M. André Delebecque.—On the subterranean streams near Vercors (Drôme), by MM. E. A. Martel and A. Delebecque.—Relations between lunar movements and barometric movements on the northern hemisphere, by M. A. Poincaré.—Extraordinary rains: the pink rain at Croisic (Loire-Inférieure) of November 8, 1896.

DIARY OF SOCIETIES.

THURSDAY, November 26.

Royal Society, at 4.30.—Mathematical Contributions to the Theory of Evolution. On Telegony in Man, &c.: Prof. Karl Pearson, F.R.S., and Miss Alice Lee.—On the Magnetic Permeability of Liquid Oxygen and Liquid Air: Prof. Fleming, F.R.S., and Prof. Dewar, F.R.S.

Institution of Electrical Engineers, at 8.—The Telephone Trunk Line System in Great Britain: J. Gavey. (Continuation of Discussion.)

South London Entomological and Natural History Society, at 8.—Exhibition of Varieties in all Orders.

FRIDAY, November 27.

Physical Society, at 5.—Apparatus for giving Diagrams of the Efficiency of a Photographic Shutter: Captain Abney, F.R.S.

MONDAY, November 30.

Society of Arts, at 8.—The Use of Gas for Domestic Lighting: Prof. Vivian B. Lewes. (Three Lectures.)

Institute of Actuaries, at 7.—Inaugural Address by the President, T. E. Young.

TUESDAY, December 1.

Zoological Society, at 8.30.—On the General Results of his Zoological Expedition to Madagascar: Dr. Forsyth Major.—Notes on a Collection of Reptiles and Batrachians made in the Malay Peninsula, with a List of the Species hitherto recorded from that Region: Stanley S. Flower.—Description of New Fishes from the Upper Shiré River, British Central Africa, collected by Dr. Percy Rendall, and presented to the British Museum by Sir Harry H. Johnston, K.C.B.: G. A. Boulenger, F.R.S.

Institution of Civil Engineers, at 8.—Paper to be further discussed: The Bacterial Purification of Water: Percy F. Frankland, F.R.S.

WEDNESDAY, December 2.

Society of Arts, at 8.—The Teaching of Economics: W. A. S. Hewins.

Geological Society, at 8.—Another Possible Cause of the Glacial Epoch: Prof. Edward Hull, F.R.S.—On the Affinities of the Echinothuridæ, and on Pedinothuria and Elikodiadema, Two New Genera of Echinoidea; On Echinocystis and Palæodiscus, Two Silurian Genera of Echinoidea: Dr. J. W. Gregory.

Entomological Society, at 8.

Society of Public Analysts, at 8.—Some Analyses of Water from an Oyster Fishery; Note on Weighing out Fats; Remarks on Formaldehyde: Chas. E. Cassal.—Note on Formalin: Dr. Samuel Rideal and Ronald Orchard.—Notes on Prussian Blue: Frank H. Leeds.—The Estimation of Borax and Boracic Acid in Milk: Frank P. Perkins.—Note on Copper in Oysters: W. F. Lowe.—The Statement of Analytical Results: J. F. Liverseege.

THURSDAY, December 3.

Linnean Society, at 8.—Does Natural Selection play any part in the Origin of Species among Plants: Rev. Geo. Henslow.

Chemical Society, at 8.—Election of Fellows.—Constitution and Colour: Arthur G. Green.—Some Experiments on Sea-water: E. Sonstadt.—Derivatives of α-Hydrindone: C. Revis and Dr. F. S. Kipping.—Notes on Nitration: Dr. H. E. Armstrong.—2 : 3′ Bromobetanaphthol: Dr. H. E. Armstrong and W. A. Davis.—Derivatives of Nitrobetanaphthols: W. A. Davis.—Morphotropic Relations of Betanaphthol Derivatives: W. A. Davis.—Researches on Tertiary Benzenoid Amines: Miss C. Evans.

FRIDAY, December 4.

Geologists' Association, at 8.—The Foraminifera of the Thanet Beds of Pegwell Bay: H. W. Burrows and Richard Holland.

Institution of Civil Engineers, at 8.—Address by J. Wolfe Barry, C.B., F.R.S. (President).—Railway Signalling: David W. Kinmont.

SUNDAY, December 6.

Sunday Lecture Society (St. George's Hall), at 4.—New Zealand—the World's Wonderland: W. Herbert-Jones.

BOOKS, PAMPHLETS, and SERIALS RECEIVED.

Books.—Habit and Instinct: C. Lloyd Morgan (Arnold).—Gleanings from the Natural History of the Ancients; Rev. M. G. Watkins (Stock).—The Metric System of Weights and Measures: Prof. W. H. Wagstaff (Whittaker).—The Dynamo: C. C. Hawkins and F. Wallis, 2nd edition (Whittaker).—Auto-Cars: D. Farman (Whittaker).—"Carriages without Horses shall go": A. R. Sennett (Whittaker).—Transformers for Single and Multiphase Currents: G. Kapp (Whittaker).—A-birding on a Bronco: F. A. Merriam (Boston, Mass., Houghton).—Prehistoric Man and Beast: Rev. H. N. Hutchinson (Smith, Elder).—Cambridge Natural History. Vol. 2. Worms, Rotifers, and Polyzoa: Gamble, Sheldon Shipley, Hartog, Benham, Beddard, and Harmer (Macmillan).—Hindu Astronomy: W. Brennand (Straker).—The Earth and its Story: Prof. A. Heilprin (Gay and Bird).—British Patent Laws and Patentees' Wrongs and Rights: H. Haes (Whittingham).—Elements of Differential Calculus: Prof. E. W. Bass Chapman).—Locomotive Mechanism and Engineering: H. C. Reagan, jun., 2nd edition (Chapman).—Notes for Chemical Students: Prof. R. T. Austen, 2nd edition (Chapman).—Experiments upon the Contraction of the Liquid Vein issuing from an Orifice: H. Bazin, translated by J. C. Trautwine, jun. (Chapman).—A Text-Book on Shades and Shadows and Perspective: J. E. Hill, 2nd edition (Chapman).—Tables for Iron Analysis: J. A. Allen (Chapman).—Handbook of Courses open to Women in British, Continental, and Canadian Universities: J. Maddison (Macmillan).—Journal and Proceedings from the Royal Society of New South Wales for 1895, Vol. xxix. (Sydney).—Report of the Commissioner of Education for the Year 1893-4, Vol. 2 (Washington).—Botanical Microtechnique: Dr. A. Zimmermann, translated by J. E. Humphrey (Constable).—The True Grasses: E. Hackel, translated by F. Lamson-Scribner and E. A. Southworth (Constable).—Charles Pritchard, D.D., F.R.S., &c.: A. Pritchard, and others (Seeley).—Chemistry for Engineers and Manufacturers. Vol. 2. Chemistry of Manufacturing Processes: B. Blount and A. G. Bloxam (Griffin).—Select Methods in Inorganic Quantitative Analysis: Prof. F. C. Smith (Edinburgh, Clay).—Among British Birds in their Nesting Haunts, illustrated by the Camera: O. A. J. Lee, Part 1 (Edinburgh, Douglas).

Pamphlets.—Sulla Propagazione dell' Electtricita nei Gas Attravusati dai Raggi di Röntgen: Prof. A. Righi (Bologna).—The Principal Household Insects of the United States (Washington).—Revue Météorologique. Travaux du Réseau Météorologique du Sud-Ouest de la Russie dix ans d'Existence: A. Klossovsky (Odessa).

Serials.—Encyklopædie der Naturwissenschaften, Erste Abthg., 69 to 70 Liefg., Dritte Abthg. 34 to 37 Liefg. (Breslau, Trewendt).—The Bachelor of Arts, November (New York).—Physical Review, Vol. iv. No. 2 (Macmillan).—Publications of the Leander McCormick Observatory of the University of Virginia, Vol. 1, Part 7 (Charlottesville).—Proceedings of the American Academy of Arts and Sciences, new series, Vol. xxiii. (Boston, Mass., Wilson).—Morphologisches Jahrbuch, 24 Band, 3 Heft (Leipzig, Engelmann).—Centralblatt für Anthropologie, &c., 1896, Heft 4 (Breslau, Kern).—Astrophysical Journal, November (Wesley).

CONTENTS.

PAGE
Sir Joseph Banks's Journal 73
Three New Books on Histology. By Prof. E. A. Schäfer, F.R.S. 74
Aspects of Gardening 75
Geomorphological Speculation. By H. R. M. . . . 76
Our Book Shelf:—
  W. H. "A New Speculation on the Past and Future Temperature of the Sun and Earth."—**R. A.** . . . 77
  Emtage: "Light" 77
  Allen: "Tables for Iron Analysis" 77
  Austen: "Notes for Chemical Students" 77
  Abbott: "Notes of the Night, and other Outdoor Sketches" 77
Letters to the Editor:—
  Osmotic Pressure and Ionic Dissociation.—**Dr. Henry E. Armstrong, F.R.S.** 78
  On the Publication of Original Work.—**Swale Vincent** 79
  Cultivation of Woad.—**W. H. Wheeler; Rosa M. Barrett** 79
  "X-Rays with a Wimshurst Machine."—**T. C. Porter** 79
Flying Bullets. (*Illustrated.*) 79
Sir B. W. Richardson, F.R.S. 80
Notes 80
Our Astronomical Column:—
  Stars with Peculiar Spectra 84
  The Leonids 84
Mr. Balfour on Science and Industry 85
The Long Period Weather Forecasts of India. By Douglas Archibald 85
The New Research Laboratory of the Royal College of Physicians of Edinburgh 88
A Reputed Malagasy Monkey. By R. Lydekker, F.R.S. 89
Microscopic Marine Organisms in the Service of Hydrography. By Prof. P. T. Cleve 89
University and Educational Intelligence 91
Scientific Serials 91
Societies and Academies 92
Diary of Societies 96
Books, Pamphlets, and Serials Received 96